

Voice and Physical Appearance in Female-to-Male Transsexuals

John Van Borsel, Kathelijne de Pot, and Griet De Cuypere, Ghent, Belgium

Summary: The study aims to investigate if a similar interaction between physical appearance and voice could be found in female-to-male transsexuals as had been observed in male-to-female transsexuals. A panel of judges rated “maleness” of seven female-to-male transsexuals from video-recorded speech samples using three modes of presentation: auditory-only presentation, visual-only presentation, and audiovisual presentation. For the group of transsexuals as a whole, no significant differences were found between scores given in the auditory-only mode or the visual-only mode and those given in the audiovisual mode. Analysis of individual results, however, yielded significant differences in some individuals and there was some relation with hormone treatment. There was no significant correlation between the ratings of “maleness” in the auditory-only mode and fundamental frequency. Physical appearance in female-to-male transsexuals appears not to be a strong influencing factor in general, but may interact with gender recognition based on the voice in some individuals. The absence of a correlation between fundamental frequency and rating of maleness could mean that in female-to-male transsexuals, fundamental frequency is a relatively less important factor for gender expression or perhaps also that a higher voice in males is more accepted than a lower voice in females.

Key Words: Voice–Transsexuals–Gender–Physical appearance.

INTRODUCTION

One of the most accepted differences between male and female voices is the use of a higher average fundamental frequency in females.¹ This difference is of particular importance in transsexuals. Studies investigating the role of fundamental frequency in gender recognition in male-to-female transsexuals have indicated that an increase from the typical male frequency of about 120 Hz to at least 155 or 160 Hz is necessary for biological males to be perceived as females.^{2–4} There is also some indication, however, that sex judgments based on the voice may be influenced by factors other than fundamental frequency. Among these is the acceptability of the physical appearance of an individual.

In a listener experiment by Van Borsel et al.,⁵ laypersons and students in speech-language pathology rated “femaleness” of male-to-female transsexuals from video-recorded speech samples in three modes of presentation: auditory-only presentation, visual-only presentation, and audiovisual presentation. Results showed that appearance and voice are indeed interacting factors. The male-to-female transsexuals of this study obtained better scores for femaleness when judged from the visual-only mode than when judged from the audiovisual mode, and better scores when judged from the audiovisual mode than when judged from the auditory-only mode. These findings indicate that the success of vocal training in male-to-female transsexuals is not solely dependent on vocal characteristics, and that speech pathologists should consider incorporating physical appearance as a treatment and outcome variable in the voice training of male-to-female transsexuals.

As far as we could ascertain, studies of voice and gender recognition in transsexuals had male-to-female transsexuals as participants. Voice and gender recognition in female-to-male transsexuals has apparently not received attention. Voice change generally seems to be less problematic in female-to-male transsexuals.^{2,6–8} Usually the desired change, that is, lowering of the pitch range of the voice, takes place automatically under the influence of androgen administration. It is unclear, however, if this also implies that gender recognition based on the voice in female-to-male transsexuals is less sensitive to the influence of physical appearance.

This study, therefore, was to investigate physical appearance and voice in female-to-male transsexuals and to see if a similar interaction between these two aspects could be found as had been observed in male-to-female transsexuals.

MATERIALS AND METHODS

A possible interaction between voice and physical appearance was investigated by having a panel of judges rating “maleness” of female-to-male transsexuals from video-recorded speech samples using three modes of presentation: auditory-only presentation (only hearing a subject’s speech), visual-only presentation (only seeing a subject speak, but not hearing the subject’s speech), and audiovisual presentation (hearing and seeing a subject speak).

The female-to-male transsexuals were seven patients from the caseload of transsexual patients from the Ghent University gender team. All of them had a confirmed diagnosis of female-to-male gender dysphoria. Their ages ranged from 19.1 years to 43.6 years (mean 31.6 years). Four were receiving male hormones and two of them had already undergone sex reassignment surgery when the experiment took place. Average fundamental frequency, as measured (*Computerized Speech Lab*, Kay Elemetrics) during reading of the Dutch version of the text “The north wind and the sun” from the International Phonetic Association⁹ ranged from 140 to 190 Hz (mean 163 Hz). Individual subject data of the female-to-male transsexuals are summarized in Table 1.

Accepted for publication October 29, 2007.

From the Ghent University Hospital, Ghent, Belgium.

Address correspondence and reprint requests to John Van Borsel, Ghent University, ENT Department, UZ Gent 2P1, De Pintelaan 185, B-9000 Ghent, Belgium. E-mail: john.vanborsel@ugent.be

Journal of Voice, Vol. 23, No. 4, pp. 494–497

0892-1997/36.00

© 2009 The Voice Foundation

doi:10.1016/j.jvoice.2007.10.018

The panel of judges consisted of 34 laypersons (16 females and 18 males) and 12 speech-language pathologists (all females) recruited by convenience sampling from the circle of acquaintances of one of the investigators. Age of the judges ranged from 18.10 years to 32.5 years (mean 24.2 years). To control for order or sequence effects, the judges were randomly divided into two groups (group 1 and group 2) each containing 17 naïve observers (nine male and eight female) and six speech-language pathologists. Group 1 judged the transsexuals' maleness first in the auditory-only mode and then in the audiovisual mode, group 2 rated maleness first in the visual-only mode and then in the audiovisual mode.

The video-recorded speech samples used in the experiment were fragments of approximately 1.30 minutes during which the transsexual clients described their leisure activities and holiday plans. The participants were all dressed as a male and were filmed (Sony Video Hi 8 camera, Sony Corporation, Tokyo, Japan) in a standardized way: front view with only head and shoulders visible. All video recordings took place in a sound-protected room in the University's speech-language hearing clinic. The samples were dubbed on a VHS tape and presented to the judges in a quiet classroom using a conventional television set. Each sample was presented only once with 1 minute in-between the samples for scoring. Scoring took place immediately after presentation of a sample without possibility of changing the score. The judges rated maleness on a 10-point equal interval scale with 1 (not at all male) and 10 (very male) as left and right extremes, respectively. Before the presentation of the samples, the judges were told that they would have to look at and/or listen carefully to speech samples and score them for "maleness" but they were not told that the subjects involved were transsexuals and they were not informed about the purpose of the experiment.

RESULTS

A preliminary analysis showed that the scores of both groups of judges were sufficiently reliable (Cronbach's alpha for group 1: 0.810; for group 2: 0.756). Comparison of the scores of the naïve judges and those of the speech-language pathologists (using the average of scores assigned to each subject) revealed only one difference: in the audiovisual mode, the speech-language pathologists of group 1 assigned higher "maleness" scores

(Wilcoxon signed ranks test, $Z = -2.388$; $P = 0.017$) than the naïve judges. In all other cases, naïve judges and speech-language pathologists scored similarly (group 1: auditory-only mode, $P = 0.866$; group 2: visual-only mode, $P = 0.248$; audiovisual mode, $P = 0.399$). It seemed justified, therefore, to pool the results of the two types of judges in subsequent analyses.

For the group of transsexuals as a whole, comparison of the maleness scores given in the auditory-only mode with those given in the audiovisual mode (rating performed by group 1) showed no significant difference (Wilcoxon signed ranks test, $Z = -0.845$; $P = 0.398$). Also the comparison of scores in the visual-only mode with those in the audiovisual mode (rating performed by group 2) did not yield a significant difference (Wilcoxon signed ranks test, $Z = -0.851$; $P = 0.395$). These results seem to suggest that in female-to-male transsexuals sex judgments based on the voice are not influenced by physical appearance.

Inspection of individual results, however, showed that at least in some instances there was a considerable difference between scores of the audiovisual mode, and those of the auditory-only or visual-only mode. It was therefore decided to also compare the ratings for the different modes for each individual separately. Results of this analysis are summarized in Table 2. Results indicate that in three individuals (S2, S4, and S6) maleness was rated significantly higher in the visual-only mode than in the audiovisual mode, and in two individuals (S4 and S5) maleness was rated significantly higher in the audiovisual mode than in the auditory-only mode. Apparently, physical appearance did influence the judges' perception in these individuals. Interestingly, three of these individuals (S2, S4, and S6) were the ones who were already receiving male hormones. S5 did not receive male hormones, but he was the one with the highest speaking fundamental frequency (190 Hz). Conversely, S1 did receive hormone therapy and was not rated more or less male in the different modes, but he was the one with the lowest speaking fundamental frequency (140 Hz). Only the results for S3 are puzzling. This participant was rated significantly more male in the auditory-only mode than in the audiovisual mode. This result can hardly be ascribed to a good low voice or more-reduced pitch variation as typically seen in males (average speaking fundamental frequency was 164 Hz with a standard deviation of 22.3 Hz), nor to a less-acceptable male appearance (a score of 6.3 in the visual-only mode).

TABLE 1.
Individual Subject Data of the Female-to-Male Transsexuals

Subject	Age (y; mo)	Gender Reassignment Surgery	Male Hormones (Number of Months Already)	Fundamental Frequency (Mean and Standard Deviation, in Hz)
1	31; 0	Yes	Yes (36)	140 (20.9)
2	43; 6	No	Yes (6)	150 (13.4)
3	38; 8	No	No	164 (22.3)
4	27; 9	No	Yes (1)	152 (22.0)
5	24; 7	No	No	190 (26.1)
6	37; 2	Yes	Yes (27)	182 (25.4)
7	19; 1	No	No	164 (19.4)

TABLE 2.
Individual Subject Scores of “Maleness” and Results of the Statistic Analysis (Wilcoxon Signed Ranks Test) Comparing the Auditory-Only Mode and the Visual-Only Mode with the Audiovisual Mode

Subject	Group 1				Group 2			
	Auditory-Only	Audiovisual	Z	P Value	Visual-Only	Audiovisual	Z	P Value
1	7.1	7.5	−1.100	0.271	6.5	6.9	−1.039	0.299
2	4.1	4.7	−1.342	0.180	6.7	4.6	−3.699	<0.001
3	7.5	6.3	−2.710	0.007	6.3	6.7	−1.166	0.244
4	2.2	4.0	−3.368	0.001	5.6	3.8	−3.282	0.001
5	3.3	5.2	−3.225	0.001	5.3	5.0	−0.387	0.699
6	4.3	4.5	−1.013	0.311	5.5	4.0	−2.874	0.004
7	5.3	4.6	−1.077	0.094	3.9	4.3	−1.059	0.289

Significant *P*-values in bold.

A final analysis investigated the salience of fundamental frequency as a sex marker. Calculation of the relationship (Spearman rank-order correlation coefficient) between the ratings of “maleness” in the auditory-only mode and average fundamental frequency yielded a very weak and, moreover, not significant correlation ($\rho = -0.180$; $P = 0.699$). Similar results were obtained for the relationship between the ratings of “maleness” in the auditory-only mode and the standard deviation in fundamental frequency, which may be considered a measure of intonational variability ($\rho = -0.143$; $P = 0.760$).

DISCUSSION

In male-to-female transsexual clients, raising fundamental frequency is tantamount to achieve communication behavior that does not betray their biological sex. Several studies have shown that an average fundamental frequency of over 155 Hz is desirable to be perceived as female and that the degree of perceived femaleness significantly correlates with a higher average fundamental frequency.^{2–4,10} It has also been found, however, that average fundamental frequency is not the only contributing factor in creating the perception of femaleness.⁵ In particular, physical appearance and voice appear to be interacting factors in listener judgments of the femaleness of male-to-female transsexuals.

The results of the present study suggest a different outcome with regard to maleness in female-to-male transsexuals. For the group of seven male-to-female participants of this study, no significant correlation was found between average fundamental frequency and rating of maleness. Neither was there any difference, for the group as a whole, between the three modes of rating maleness (visual-only, auditory-only, and audiovisual), reflecting no influence of physical appearance.

The absence of a correlation between average fundamental frequency and rating of maleness could mean that in female-to-male transsexuals fundamental frequency is a relatively less important factor for gender expression than in male-to-female transsexuals. It could perhaps also reflect the existence of a more general trend, namely that a higher voice in males is more accepted than a lower voice in females. We know of no studies, however, to support or reject this hypothesis.

There was also no significant correlation between the standard deviation in fundamental frequency and rating of maleness. This seems to suggest that intonational variability too is less important for gender expression in female-to-male transsexuals than in male-to-female transsexuals. Male-to-female transsexuals who are perceived as female have been found to show more intonational variability than those who are perceived as male.¹¹

An analysis of the influence of physical appearance for each individual subject did show differences between the three modes of rating maleness in at least a number of participants. The conclusion is that physical appearance in female-to-male transsexuals is not generally a strong influencing factor but may interact with gender perception from the voice in some individuals. The analysis of individual results, moreover, suggests yet another pattern. The individuals with different scores in different modes of rating (and thus showing influence of physical appearance) were the ones who were administered male hormones. There were also two exceptions, however. One participant did show different scores in different modes of rating although he did not receive hormone treatment. Another participant did receive hormone treatment but did not show different scores in different modes of rating. It appeared that they were the ones with, respectively, the highest and the lowest fundamental frequency of the group. This seems to suggest that physical appearance becomes more important as the voice is high and less important when fundamental frequency is low. From a clinical point of view, this could imply that at the beginning of hormone therapy, when there is no lowering of the voice yet, it will depend on the individual's physical appearance whether or not he will “pass” as a male. Physical appearance in this stage would seem to function as a kind of “corrector” for the voice. Later, once the voice is already lower, physical appearance becomes less important. The role of physical appearance as a “corrector” could be important in those (exceptional) cases where hormone therapy does not yield the anticipated effect and the voice remains in the high female range.

Finally, it is clear that some of the hypotheses forwarded here await further research. It would be interesting, for instance, to study voice and physical appearance in a group of participants who are at different stages of hormone treatment. It might also

be interesting to study voice and physical appearance with fuller body visualization, including, for instance, the hip area. Perhaps this may yield different scores for the visual-only mode than in the present study where only head and shoulders were visible.

REFERENCES

1. Oates J, Dacakis G. Voice change in transsexuals. *Venereology*. 1997;10: 178-187.
2. Spencer LE. Speech characteristics of male-to-female transsexuals: a perceptual and acoustic study. *Folia Phoniatr*. 1988;40:31-42.
3. Wolfe V, Ratusnik DL, Smith FH, Northrop G. Intonation and fundamental frequency in male-to-female transsexuals. *J Speech Hear Disord*. 1990;55: 43-50.
4. Brown M, Perry A, Cheesman AD, Pring T. Pitch change in male-to-female transsexuals: has phonosurgery a role to play? *Int J Lang Commun Disord*. 2000;35:129-136.
5. Van Borsel J, De Cuypere G, Van den Berghe H. Physical appearance and voice in male-to-female transsexuals. *J Voice*. 2001;15:570-575.
6. Battin RR. Treatment of the transsexual voice. In: Perkins WH, ed. *Current Therapy of Communication Disorders: Voice Disorders*. New York, NY: Thieme-Stratton; 1983:63-66.
7. Hamburger C. Endocrine treatment of male and female transsexualism. In: Green R, Money J, eds. *Transsexualism and Sex Reassignment*. Baltimore, MD: Johns Hopkins University Press; 1969:291-307.
8. Colton RH, Casper JK, Hirano M. *Understanding Voice Problems: A Physiological Perspective for Diagnosis and Treatment*. Baltimore, MD: Williams & Wilkins; 1996.
9. International Phonetic Association. *The Principles of the International Phonetic Association*. London: University College London; 1974.
10. Van Borsel J, Van Eynde E, De Cuypere G, Bonte K. Feminine after cricothyroid approximation? *J Voice* DOI: 10.1016/j.jvoice.2006.11.001.
11. Gelfer MP, Schofield KJ. Comparison of acoustic and perceptual measures of voice in male-to-female transsexuals perceived as female versus those perceived as male. *J Voice*. 2000;14:22-33.